REMARKS

Elections/restrictions

Applicant hereby confirms the provisional election made during a telephone conversation with the Examiner on December 20, 2004. More specifically, the present application should be prosecuted on the basis of species A and E as identified by the Examiner in the Office Action dated December 28, 2004.

Amendments to the claims

Claims 1-13, 16 and 18-31 are pending, claims 14, 15 and 17 have been withdrawn, and claims 1, 4, 5, 8, 10-13, 16, 18-20, 24, 26 and 27 have been amended.

Sole independent claim 1 has been amended to define the actuating means for periodically shifting the pump membrane between the maximum volume position and the drained volume position as an actual part of the pump device, and a clause has been added to more explicitly indicate that the arrangement of the different structures of the pump provides a metering pump, this as indicated in the paragraph bridging pages 4 and 5 of the specification as originally filed.

Claims 19, 26 and 27 have been amended to overcome the objections as to dependency.

Claim 24 has been amended to correctly identify "the pump device" and "the pump assembly".

Claims 12 and 13 have been amended to correctly recite features in Markush form.

Claim 12 has been amended to refer to claim 7, thereby providing antecedent for "the means for providing the flow of fluid" in claim 12 and "the means for controlling the flow of fluid" in claim 13.

In claims 1, 4, 5, 8, 10, 11, 16, 18-20 and 29 reference numerals have been deleted.

Amendments to the Specification

In the specification on page 14 a reference to new drawing 1C has been inserted, and the description of figs. 8D-8H has been amended in accordance with the amended figure 8D.

Further, during revision of the drawings a number of minor typographical errors have been corrected. More specifically, on page 22 the lower wall portion 853 has correctly been indicated as concave instead of convex, see fig. 8E as originally filed. On page 26 the description of fig. 11 has been brought into consistency with that figure, and on page 27 the inlets and outlets as identified with reference numerals in figs. 13A and 13C as originally filed have been described.

Amendments to the Drawings

A complete set of new formal drawings on sheets 1/16-16/16 is attached to this amendment document which replaces the drawings on file. The new figures correspond to the originally filed figures except for the following amendments.

In figure 1A the reference numerals 162, 172, 163 and 173 have been deleted. A new figure 1C showing the valves of fig. 1A in greater detail has been added, the new figure showing the holes 162, 172, and valve seats 163, 173.

In figures 4A, 8K and 8L the parts in section have been hatched.

In figure 8A the reference numerals 871 and 861 have been inserted instead of 87 and 86, and in figure 10 the reference numeral 1340 has been added.

In figure 8D the ends of the broken lines indicating sectional views have been renamed E-E and F-F instead of B-B and A-A and arrows have been added.

In figs. 8E and 8F the reference numeral 851 has been replaced with 850, and the reference numerals 852 and 853 have been added, this in accordance with the corresponding description on page 22, third full paragraph. In fig. 8H the reference numeral 854 has been deleted as it is not to be found in the corresponding description.

In figure 11 the legend --Prior Art-- has been inserted.

Claim rejections – 35 USC 112

The Examiner has rejected claims 12 and 13 as being indefinite.

Claims 12 and 13 have been amended to correctly recite features in Markush form.

Claim 12 has been amended to refer to claim 7, thereby providing antecedent for "the means for providing the flow of fluid" in claim 12 and "the means for controlling the flow of fluid" in claim 13.

Claim rejections – 35 USC 102

The examiner has rejected claims 1-3 and 6 under 35 USC 102(b) as being anticipated by Yorita et al, US patent 5,520,523.

Yorita et al discloses a diaphragm pump for use in a fuel injection system. The pump comprises a diaphragm (i.e. a pump membrane) arranged in a pump cavity between a stopper 24 of conical shape and a recess 21 of inverted conical shape, see column 3, lines 44-55, whereby a fuel pressurizing chamber 25 is defined between the recess and the top surface of the diaphragm.

The pump further comprises a reciprocating plunger 30 arranged in a cylinder chamber 31 which communicates with the lower surface of the diaphragm via through holes 24a formed in the stopper 24. The plunger is actuated by a rotating cam shaft mechanism arranged in an oil-filled housing, the same oil being used to fill the cylinder chamber, see column 4, lines 21-29. When the plunger 30 is moved upwardly the oil in the cylinder chamber 31 flows into the gap between the diaphragm 23 and the diaphragm stopper 24 through the through holes 24a of the diaphragm stopper, whereby the diaphragm 23 is pressed upwardly by the oil. When the plunger reaches the top dead center, the diaphragm is deformed to its maximum, and discharge of the fuel is completed, see column 4, lines 42-65.

As appears, in the Yorita et al pump the pump membrane is moved between its initial position in contact with the stopper 24 and its maximum position by the upwards movement of the plunger 30, whereby the maximum position is determined by the stroke of the

plunger and not by the properties of the recess 21.

In contrast, in amended claim 1 it is defined that the pump device comprises actuating means for periodically shifting the pump membrane between the maximum volume position and the drained volume position, the drained volume position being defined as the position in which the first membrane surface in a stretched state abuts and substantially conforms to the general configuration the first wall portion. By this arrangement the metering accuracy of the pump device of the present invention is determined by the first and second wall portions and not by the precision of the actuation means, e.g. heating means.

As oil is virtually incompressible, this would mean that if the Yorita et al pump should be adapted to work corresponding to the principle of the present invention the stroke volume of the plunger 30 would have to exactly match the volume of the pump cavity between the diaphragm 23 and the recess 21. If the volume was slightly too small, the diaphragm 23 would not abut the recess 21, and if the volume was slightly too large, the plunger would be prevented from reaching its top dead center due to the incompressibility of the oil, this resulting in jamming or excessive wear of the actuation mechanism.

Consequently, applicant submits that the skilled person would avoid using a plunger stroke volume exactly identical to the volume of the pump cavity between the diaphragm and the recess as this would (a) increase risk of damage and wear to the pump, and (b) would not provide any desirable properties as the desired stroke volume in any case would be determined by the stroke volume for the plunger. Further, the Yorita et al pump is not intended as a metering pump but as a pump for pressurizing the reserve tank 5.

Claim objections

Claims 19, 26 and 27 have been amended to overcome the objections as to improper reference to other claims.

CONCLUSION

In view of the above, it is respectfully submitted that all outstanding issues raised by the Examiner have been addressed and therefore all claims are in condition for allowance. Early action to that end is respectfully requested. The Commissioner is hereby authorized to charge any fees in connection with this application and to credit any overpayments to Deposit Account No. 14-1447. The Examiner should feel free to contact applicant's attorney by telephone if there are any questions concerning this amendment or application.

Respectfully submitted,

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